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(54) **Process for the manufacture of 1,1,1,3,3-pentafluoropropane**

(57) A process for the manufacture of 1,1,1,3,3-pentafluoropropane, which comprises reacting 1,1,1,3,3,3-hexafluoropropane with a source of hydrogen.

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Description

[0001] The present invention relates to a process for the manufacture of 1,1,1,3,3-pentafluoropropane. 1,1,1,3,3-pentafluoropropane is useful amongst others as constituent of blowing agents for polyurethane foams in compositions with 1,1,1,3,3-pentafluorobutane.

[0002] The invention allows for efficient manufacture of 1,1,1,3,3-pentafluoropropane.

[0003] The invention concerns a process for the manufacture of 1,1,1,3,3-pentafluoropropane, which comprises reacting 1,1,1,3,3,3-hexafluoropropane with a source of hydrogen. The 1,1,1,3,3,3-hexafluoropropane is generally reacted with a source of hydrogen under conditions maximizing production of 1,1,1,3,3-pentafluoropropane.

[0004] In the process according to the invention the reaction is generally carried out in the presence of a hydrogenation catalyst. This catalyst is preferably selected from metals of Group VIII of the periodic table of elements, more particular it is selected from Pd, Pt, Rh, Ru, Ni and Ir. Pd is preferred.

[0005] The catalyst is preferably supported. Support can be active carbon, alumina, fluorinated alumina, $LiAl_5O_8$, or fluorinated derivative thereof.

[0006] The source of hydrogen is preferably hydrogen gas. The molar ratio of hydrogen (or hydrogen equivalent) to 1,1,1,3,3,3-hexafluoropropane is generally from 1 to 5, often from1,5 to 3 and preferably from1,5 to 2.

[0007] In the process according to the invention the reaction can suitably be carried out in the gas phase. In that case the reaction is generally carried out at a temperature from 0 to 500°C, often the temperature is from 50 to 250°C and preferably from 80°C to 200°C. In that case, the reaction is generally carried out at a pressure from 1 to 20 bar, often the pressure is from 2 to 10 bar and preferably from 1,5 to 5 bar.

[0008] In another embodiment, the reaction is carried out in the liquid phase. In that case the reaction is generally carried out at a temperature from 50 to 250°C, often the temperature is from 70 to 200°C and preferably from 80°C to 150°C. In that case, the reaction is generally carried out at a pressure from 1 to 60 bars, often the pressure is from 5 to 50 bars and preferably from 10 to 40 bars.

[0009] In the process according to the invention the reaction can suitably be carried out continuously. It can also be carried out batchwise.

[0010] In a particular embodiment, the process according to the invention comprises

(a) reacting 1,1,1,3,3,3-hexachloropropane with hydrogen fluoride to form a reaction product comprising 1,1,1,3,3,3-hexafluoropropane and optionally starting materials and intermediates

(b) separating 1,1,1,3,3,3-hexafluoropropane from the reaction product and optionally recycling starting materials and intermediates to step (a)

(c) reacting 1,1,1,3,3,3-hexafluoropropane obtained in step (b) with a source of hydrogen according to the process of anyone of claims 1 to 9.

[0011] The manufacture of 1,1,1,3,3,3-hexafluoropropane is described for example in EP-A-522639 in the name of the applicant, the disclosure of which is incorporated by reference into the present application.

[0012] The example here after is intended to illustrate the invention without limiting it.

Example

[0013] In a stainless steel reactor a catalyst comprising 10 % Pd on active carbon is charged. Hydrogen gas is introduced continuously at a pressure of 2 bar and a temperature of 200°C. 1,1,1,3,3,3-hexafluoropropane is then introduced continuously to obtain a molar ratio H2/1,1,1,3,3,3-hexafluoropropane of 2 to 1. The reactor effluents are liquefied in a cold trap. The analysis of the contents of the cold trap shows formation of 1,1,1,3,3-pentafluoropropane.

Claims

1. A process for the manufacture of 1,1,1,3,3-pentafluoropropane, which comprises reacting 1,1,1,3,3,3-hexafluoropropane with a source of hydrogen.
2. The process of claim 1, wherein the reaction is carried out in the presence of a hydrogenation catalyst.
3. The process of claim 1, wherein the catalyst is selected from Pd, Pt, Rh, Ru, Ni and Ir.
4. The process of any one of claims 1 to 3, wherein the source of hydrogen is hydrogen gas.
5. The process of any one of claims 1 to 4, wherein the reaction is carried out in the gas phase.
6. The process of claim 5, wherein the reaction is carried out at a temperature from 0 to 500°C.
7. The process of claim 5 or 6, wherein the reaction is carried out at a pressure from 1 to 20 bar.
8. The process of any one of claims 1 to 4, wherein the reaction is carried out in the liquid phase.
9. The process of any one of claims 1 to 8, wherein the reaction is carried out continuously.
10. A process according to any one of claims 1 to 9, which comprises

(a) reacting 1,1,1,3,3,3-hexachloropropane with hydrogen fluoride to form a reaction product comprising 1,1,1,3,3,3-hexafluoropropane and optionally starting materials and intermediates

(b) separating 1,1,1,3,3,3-hexafluoropropane from the reaction product and optionally recycling starting materials and intermediates to step (a)

(c) reacting 1,1,1,3,3,3-hexafluoropropane obtained in step (b) with a source of hydrogen according to the process of anyone of claims 1 to 9.

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EUROPEAN SEARCH REPORT

Application Number
EP 06 11 1713

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	WO 98/33756 A (E.I. DU PONT DE NEMOURS AND COMPANY; SIEVERT, ALLEN, CAPRON; NAPPA, MA) 6 August 1998 (1998-08-06) Example 1 (pages 7-8). Claims 1-3. -----	1	INV. C07C17/23 C07C19/08
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TECHNICAL FIELDS SEARCHED (IPC)

C07C

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	26 April 2006	Menchaca, R

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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A : technological background
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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 06 11 1713

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26-04-2006

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- EP 522639 A **[0011]**